Wetlands Mitigation

Wetland Mitigation Measures

ROP A-3 Hazardous Substances Contingency Plans

Minimize potential pollution through effective hazardous materials contingency planning.

ROP A-4 Spill Prevention

Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters and protect subsistence resources, public health and safety.

ROP A-5 Refueling and Fuel Storage

Minimize potential impacts of contaminants from refueling operations on fish, wildlife, and the environment.

BMP A-7

Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.

ROP A-8 Firefighting Foam Standards

Prevent the release of poly- and perfluoroalkyl substances associated with the use of aqueous film-forming foam, a firefighting foam designed to extinguish flammable and combustible liquids and gases.

ROP B-1 Water Use from Rivers and Streams

Maintain populations of, and adequate habitat for, fish and invertebrates.

ROP B-2 Water Use from Lakes

Maintain natural hydrologic regimes in soils surrounding lakes and ponds and maintain populations of, and adequate habitat for, fish, aquatic invertebrates, and birds.

Wetland Mitigation Measures cont.

ROP C-2 Winter Tundra Travel

Protect stream banks, minimize the compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.

ROP C-3 Ice Bridges

Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.

ROP E-1 Protections for Subsistence Users

Protect subsistence use and access to subsistence hunting and fishing areas and minimize potential impacts of development on subsistence resources.

ROP E-2 Infrastructure Siting Near Waterbodies

Protect fish-bearing water bodies, water quality, and aquatic habitats.

ROP E-3 Shoreline Infrastructure

Maintain free passage of marine and anadromous fish, protect shorebird staging and feeding areas, and protect subsistence use and access to subsistence hunting and fishing.

ROP E-4 Minimize Development Footprint

Minimize the impacts of the development footprint.

ROP E-5 Stream Crossing Design

Ensure the passage of fish at stream crossings and reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, and alteration of natural drainage patterns.

ROP E-7 Sand and Gravel Mining

Minimize the environmental impacts of mining sand and gravel.

Wetland Mitigation Measures cont.

ROP E-10 Use of Ecological Mapping or Equivalent

Use ecological mapping (or equivalent approach) as a tool to assess fish and wildlife habitat before development of permanent infrastructure to conserve important habitat types, including BLM sensitive plant species and habitat for BLM sensitive animal species.

LS G-1

Ensure the long-term reclamation of land to its previous condition and use.

LS K-1 River Setbacks

Minimize the disruption of natural flow patterns and changes to water quality and the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing, or overwintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts on subsistence cabins and campsites; the disruption of subsistence activities; and impacts on scenic and other resource values.

LS K-2 Deep Water Lakes

Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deep water lakes; the loss of spawning, rearing or overwintering habitat for fish; the loss of cultural and paleontological resources; impacts on subsistence cabins and campsites; and the disruption of subsistence activities.

Wetland Mitigation Measures cont.

LS K-6 Goose Molting Area

Minimize disturbance to molting geese and loss of goose molting habitat in and around lakes in the Goose Molting Area.

BMP L-1 Tundra Travel

Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for, birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.

ROP M-2 Invasive Species Prevention Plan

Prevent the introduction or spread of nonnative, invasive species in the NPR-A.

ROP M-3 Minimize Bare Soil

Reduce areas of bare soil that can contribute to dust emission to protect human health and subsistence resources.

BMP M-3

Minimize loss of populations of, and habitat for, plant species designated as Sensitive by the BLM in Alaska.

LN 3

Reclamation of Land Used for Permitted Activities

Additional Suggested Wetland Mitigation Measures

1. If Alternative C or D is selected, monitor vegetation damage and the compression of soil and vegetation in the annual resupply ice road footprint (footprints that are used consecutively each year). Because wetter landscapes show less impact from multiyear ice roads (Yokel, Huebner et al. 2007) and ADNR monitors only tussock tundra and soil compaction, this suggested measure would focus on non-tussock wetlands (including patterned ground) with a Cowardin water regime class of Temporarily Flooded, Saturated, or Seasonally Flooded Ground by vegetation type (total live cover of graminoid, shrub, forb, moss) and the percentage of bare soil would be monitored with control points and points within ice road footprints to determine changes.
2. Use vehicle and equipment wash stations and inspect vehicles and equipment for organic matter.
3. Clean tires and wheel wells so they are free from soils, seeds, and plant parts.
4. Provide stations to clean footwear and gear so they are free from soils, seeds, and plant parts.
5. Provide training to employees and contractors in the identification, control, and prevention of known invasive plant species.
6. Confine loading and unloading of soils for gravel stockpiles to the downwind side of the pile; if piles would be on-site for longer periods of time, seed with appropriate vegetation to reduce wind erosion. Wind barriers (such as snow fences) may also be appropriate in some situations.

Water Resources Mitigation Measures

Water Mitigation Measures

ROP A-2 - Waste Management Plan
Minimize impacts on the environment and protect human health and safety from nonhazardous and hazardous waste generation.

ROP A-3 Hazardous Substances Contingency Plans
Minimize potential pollution through effective hazardous materials contingency planning.

ROP A-4 Spill Prevention
Minimize the impact of contaminants on fish, wildlife, and the environment, including wetlands, marshes, and marine waters and protect subsistence resources, public health and safety.

ROP A-5 Refueling and Fuel Storage
Minimize potential impacts of contaminants from refueling operations on fish, wildlife, and the environment.

BMP A-7
Minimize the impacts to the environment of disposal of produced fluids recovered during the development phase on fish, wildlife, and the environment.

ROP A-8 Firefighting Foam Standards
Prevent the release of poly- and perfluoroalkyl substances associated with the use of aqueous film-forming foam, a firefighting foam designed to extinguish flammable and combustible liquids and gases.

ROP B-1 Water Use from Rivers and Streams
Maintain populations of, and adequate habitat for, fish and invertebrates.

ROP B-2 Water Use from Lakes
Maintain natural hydrologic regimes in soils surrounding lakes and ponds and maintain populations of, and adequate habitat for, fish, aquatic invertebrates, and birds.

Water Mitigation Measures cont.

ROP C-2 Winter Tundra Travel

Protect stream banks, minimize the compaction of soils, and minimize the breakage, abrasion, compaction, or displacement of vegetation.

ROP C-3 Ice Bridges

Maintain natural spring runoff patterns and fish passage, avoid flooding, prevent streambed sedimentation and scour, protect water quality, and protect stream banks.

ROP C-4 Winter Travel Along Streambeds

Avoid additional freeze-down of water harboring overwintering fish.

ROP E-1 Protections for Subsistence Users

Protect subsistence use and access to subsistence hunting and fishing areas and minimize potential impacts of development on subsistence resources.

ROP E-2 Infrastructure Siting Near Waterbodies

Protect fish-bearing water bodies, water quality, and aquatic habitats.

ROP E-3 Shoreline Infrastructure

Maintain free passage of marine and anadromous fish, protect shorebird staging and feeding areas, and protect subsistence use and access to subsistence hunting and fishing.

ROP E-4 Minimize Development Footprint

Minimize the impacts of the development footprint.

ROP E-5 Stream Crossing Design

Ensure the passage of fish at stream crossings and reduce the potential for ice-jam flooding, impacts to wetlands and floodplains, erosion, and alteration of natural drainage patterns.

ROP E-7 Sand and Gravel Mining

Minimize the environmental impacts of mining sand and gravel.

Water Mitigation Measures cont.

ROP E-10 Use of Ecological Mapping or Equivalent

Use ecological mapping (or equivalent approach) as a tool to assess fish and wildlife habitat before development of permanent infrastructure to conserve important habitat types, including BLM sensitive plant species and habitat for BLM sensitive animal species.

LS G-1

Ensure the long-term reclamation of land to its previous condition and use.

LS K-1 River Setbacks

Minimize the disruption of natural flow patterns and changes to water quality and the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of floodplain and riparian areas; the loss of spawning, rearing, or overwintering habitat for fish; the loss of cultural and paleontological resources; the loss of raptor habitat; impacts on subsistence cabins and campsites; the disruption of subsistence activities; and impacts on scenic and other resource values.

LS K-2 Deep Water Lakes

Minimize the disruption of natural flow patterns and changes to water quality; the disruption of natural functions resulting from the loss or change to vegetative and physical characteristics of deep water lakes; the loss of spawning, rearing or overwintering habitat for fish; the loss of cultural and paleontological resources; impacts on subsistence cabins and campsites; and the disruption of subsistence activities.

LS K-5 Coastal Area Setback

Protect coastal waters and their values as fish and wildlife habitat (including, but not limited to, that for waterfowl, shorebirds, and marine mammals); minimize hindrance or alteration of caribou movement within caribou coastal insect-relief areas; protect the summer and winter shoreline habitat for polar bears and the summer shoreline habitat for walruses and seals; prevent loss of important bird habitat and alteration or disturbance of shoreline marshes; and prevent impacts on subsistence resources and activities.

LS K-6 Goose Molting Area

Minimize disturbance to molting geese and loss of goose molting habitat in and around lakes in the Goose Molting Area.

BMP L-1 Tundra Travel

Protect stream banks and water quality; minimize compaction and displacement of soils; minimize the breakage, abrasion, compaction, or displacement of vegetation; protect cultural and paleontological resources; maintain populations of, and adequate habitat for, birds, fish, and caribou and other terrestrial mammals; and minimize impacts to subsistence activities.

Additional Suggested Water Mitigation Measures

1. Unless a more appropriate method is available, when estimating flood-peak discharge at locations within the Fish (Iqalliqpik) Creek, Judy (Iqalliqpik) Creek, and Ublutuoch (Tiŋmiaqsiuġvik) River basins, use a weighted average from a single station analysis of the BLM long-term monitoring station data on each of these streams and the Shell regression equations (Appendix E.8A). Weight the results of the two computations based on the uncertainty associated with each estimate.

2. As appropriate, consider both 1) snow- and ice-impacted conditions and 2) ice-free conditions in the hydraulic design of bridges, culverts, and pipeline river crossings. Cross-section data at the time of the peak stage and peak discharge that are available for many rivers and streams indicate that the WSE was affected by snow and/or ice blockage. Based on the available information, develop designs that would perform satisfactorily during the design event considering both the possibility of open-water conditions and the possibility that snow and ice blockage is occurring at the time of the design event. At a minimum, the magnitude of the blockage used in the designs should be similar to the magnitude of the blockage that has been observed.

3. At a minimum, design culverts to perform satisfactorily for all flood events up to and including the 50-year event. The headwater-to-diameter ratio at the maximum design condition should be no greater than 1.0.

4. Identify the locations requiring cross-drainage culverts during spring breakup prior to construction by noting all locations where water is flowing over the proposed alignment. This is necessary because it is often not possible to determine where water flowing in polygon troughs will cross the alignment during a summer or fall inspection. At the same time, identify the ends of the proposed culverts and the invert elevation of the ends of the culvert in order to maintain the flow in the historic flow path.

Additional Suggested Water Mitigation Measures cont.

5. At a minimum, design road bridges to pass the 50-year flood-peak discharge with a minimum of a 3-foot freeboard (assuming snow and ice conditions have been considered in estimating the design water surface elevation). Design for bridge foundation scour equal to the maximum scour depth produced by floods up through a magnitude equal to the 100-year flood event and a geotechnical design practice safety factor of from 2 to 3. Check the bridge design using a superflood and a geotechnical design practice safety factor of 1. The superflood is defined as the 500-year event, 1.7 times the magnitude of the 100-year event, or the overtopping flood, whichever is the least. These are standard criteria used by Alaska Department of Transportation and Public Facilities for bridges on the North Slope in nondesignated flood hazard areas.

6. At a minimum, design pipeline river crossings to perform satisfactorily for all floods up to and including the 200-year event (including crossings on bridges or VSMs). This is the magnitude of the design event that has typically been used for common carrier pipelines on the North Slope and a higher level of design than is being proposed for the Project.

7. Start bridge and culvert hydraulic computations sufficiently downstream so that the downstream boundary assumptions do not affect the performance of the proposed design. Consider the USACE (1986) report Accuracy of Computed Water Surface Profiles in determining the location of the downstream boundary for hydraulic computations.

8. If the highest observed WSE or high-water mark is higher than the predicted 50-year WSE at a culvert, bridge, or pipeline, reevaluate the design water surface elevation to confirm that snow and ice blockage and other details of the computation are accurate. Given the conditions on the North Slope, it is unlikely that high-water marks from a 50-year flood or greater would be recognizable unless it occurred in the last 10 to 20 years. Additionally, it is improbable that a 1- to 5-year field program would experience a 50-year flood. It is more likely that snow and ice blockage greater than accounted for in the model used to predict the 50-year WSE or an error in the downstream boundary condition used in the model has occurred.

Additional Suggested Water Mitigation Measures cont.

9. Use a freeboard at bridges and pipeline crossings, which considers the uncertainty in the magnitude of the design flood, the uncertainty in the hydraulic computations, and the height of the ice and debris that may be carried by the flood but is not less than 3 feet.

10. Where an aboveground pipeline crossing is immediately upstream from a road, backwater from the road during the pipeline design event should be considered when setting the bottom of the pipe elevation. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road washout should be considered (i.e., changes in location of the concentrated flow and the impact on erosion at the VSM).

11. Where an aboveground pipeline crossing is immediately downstream from a road, the impact of the road on where water would be flowing and the velocity of the water at the pipeline VSM should be considered. Additionally, if the road is designed for a smaller flood than the pipeline, the changes in hydraulic conditions at the pipeline as a result of the road washout should be considered (i.e., changes in the location of the concentrated flow and the impact on erosion at the VSM).

12. Breach ice road crossings sufficiently that ice from the crossing would not contribute to ice jams or increase snow and ice blockage during spring breakup.

13. Avoid placing multi-season ice pads in floodplains (e.g., construction pads at the mine site).

14. Prior to HDD construction, provide a monitoring and response plan for determining if drilling mud is being lost to formation or making it to the river or groundwater during drilling.

15. Should any spills occur on the MTI, the affected gravel would be addressed immediately and removed prior to MTI abandonment.

Additional Suggested Water Mitigation Measures cont.

16. If Option 1 or 2 is selected, place and maintain appropriate navigation aids on the MTI after it is decommissioned (the top of the MTI is expected to drop to or below the water surface).

17. Provide annual surveillance of bridge, culvert, and pipeline river crossings to confirm that structures are functioning properly and provide maintenance as required.

18. Continue to collect baseline data regarding discharge, ice conditions, and bank conditions on the Colville River near Ocean Point throughout winters every year until ice bridge construction so that an ice bridge plan can be drafted that would include the exact crossing location for bridge and ramps, plans for flow and fish passage management (should they be needed), actions to be taken at the end of ice bridge use (such as slotting or culvert removal, if needed). Prepare an adaptive management plan that provides detail regarding how any unanticipated surface water flow blockages would be identified and corrected as quickly as possible, to avoid lasting environmental impacts.

19. Include erosion mitigation features or options in the engineering design of boat ramp(s) to prevent or minimize erosion potential at the boat ramp(s) and along adjacent riverbanks.

20. 20. a maintenance plan for the boat ramps to ensure long-term viability and use of the site(s) while minimizing impacts to the adjacent waterbodies. Include the following points at a minimum:

    a. Identify entity responsible for site maintenance;
    b. Annual maintenance (grading) of parking pads, turning pads, access ramps, and road access;
    c. Maintain a gravel supply (off-site) to reinforce boat ramps and pads when necessary; and
    d. regular clean-up of pads and surroundings, including back-haul of trash to suitable disposal site.

21. Before construction and continuing through operations, test and monitor freshwater sources that intersect the Project for hydrocarbons.

NSB Mitigation Measures

Water Quality

a. CPAI will collect data on water quality and hydrology to help detect potential project related impacts on fish and the subsistence fishery:

i. CPAI will be required to repeat required predevelopment studies outlined by BLM and FWS (herein called baseline) every four years. Should differences be detected from baseline, then CPAI will consult with NSB-DWM on whether additional studies are required to explain differences and /or to monitor change. If CPAI divests, sells, or significantly alters management responsibility for Willow, then CPAI is required to provide funding for another year of those studies to incoming management to be conducted during the subsequent summer season.